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Knowledge Mapping of Iranian Scientific Products in the Field of Semantic Web Applications

Faezeh Sadat Bahrololomi Tabatabaei [1], Razieh Farshid[2*], Nosrat Riahiniya[3], Naved Ahmad[4]

1. PhD Student, Information Retrieval and Knowledge of Kharazmi University, Tehran, Iran. faezetabatabai@gmail.com
2. PhD Student, Information Retrieval and Knowledge of Kharazmi University, Tehran, Iran. 0000-0001-6399-8267
3. Professor, Information Science and Knowledge of Kharazmi University. Tehran, Iran. riahiniya@khu.ac.ir
4. Librarian and Head of Research Support Unit. aligzada@gmail.com, 0000-0002-4932-401X

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Abstract

Purpose: The study identified the characteristics of scientific products in the field of the semantic web application. This purpose has been done by studying six databases including Magiran, Sid, Normagz, Civilica, Comprehensive portal of humanities, and Ganj.

Method: This study is a descriptive study with a scientometric approach. purposive sampling and the techniques of co-occurrence and social network analysis have been used. Data analysis was done with Ravar Matrix software, Gefi, and data mapping was done with VosViewer software.

Findings: The frequency of scientific productions in the field of the semantic web application has been 188, among which the semantic web with a frequency of 23 is in the first place. The co-occurrence maps form eight thematic clusters. Data analysis among degree and betweenness centers showed that the semantic web and ontology, spatial database, and jurisprudence structures have the highest rate. Among the cooperation of universities, the University of Tehran has the most connections with other universities and research centers. The University of Tehran was ranked first. Islamic Azad University, Kerman Branch, Shahid Bahonar University of Kerman, and the Imam Reza International University of Mashhad are ranked first to third. The University of Tehran, Tarbiat Modares University, and the Malek Ashtar University of Technology have the highest degree of centrality of betweenness.

Conclusion: The Semantic Web is an interdisciplinary subject with many applications in all disciplines, and the results indicate its continuous growth status. **©authors**

Keywords: Semantic Web Application, Scientometrics, co-occurrence, Social Network Analysis, Intellectual Structure of Knowledge.

Corresponding Information: Razieh Farshid, PhD Student, Information Retrieval and Knowledge of Kharazmi University, Tehran, Iran. razieh.farshid@gmail.com

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1. Introduction

The world's largest electronic network, the Internet, is an example of part of the vision of new information and communication technologies. The age at which we live is the age of choosing the best information at the right time (Ghafouri, 2004). In the 1990s, the phenomenon that would change how we relate to and understand the world, the worldwide Web, was introduced. It brought the idea of a universal information space where anyone with access could write and read and modulate how data and knowledge were treated. Additionally, the notion that knowledge must be open, shared, and reusable began permeating the community (de Castro Fern´andez,2022). The worldwide Web is designed as a place for information, created to provide a platform for communication between researchers. Now, because of the simplicity of the Web, which is primarily due to the simplicity of the HTML, it has become a platform for providing any information from personal and social to family, science, sports, entertainment, and the like. To apply to human societies, computers can also share and help. According to research findings, searchers recklessly use the Web to retrieve information resources. It was created by unprecedented conditions in providing and searching for information. It is a significant challenge for researchers seeking accurate and relevant information. The semantic web is a way to control the growth of such unbridled and create suitable and easy grounds for representing and searching for information (Keshavarz, 2007, p. 88). More than two decades have passed since Tim Berners-Lee, and his team envisioned the SemanticWeb, a form of web content that would be readable and, thus, understandable and comprehensible by machines. One of the Semantic Web's most important property is the ability to provide more valuable information by automatically searching the meaning structure of web content (Giannakoulopoulos et al., 2022). The Semantic Web is the expanded form of this web that enables humans and computers to work better together. According to the archives, many current tools have automatically advanced the semantic interpretation of web pages or the structure of information sources, such as OML and related databases, using RDF (Kohler et al., 2006, p. 744). Today, the Web still makes information available to users with different information and knowledge needs, mainly through technological tools such as hypertext links and the keyword search process. Recently, new trends in the design of semantic search engines have been formed to organize the sharing, exchange, and reuse of knowledge. However, there is still a growing need for practical, integrated, coordinated, and knowledge-based standards in search engine design. Therefore, sharing and exchanging knowledge in current search engines is a significant challenge. The Semantic Web has met some of these challenges.

The Semantic Web can share web content through a particular representation language called "XML Extensible Language," which allows data to be shared and sent across a group of systems. In the semantic web, the structure of data is also defined so that it is possible to represent data based on syntactic features (machine-readable aspects), type, and definition of entities, features, and relationships between data. Accordingly, the data structure makes it possible to exchange data in interconnected systems. Hence, MARK has evolved into a UNIMARK format to allow more sharing. The semantic Web is a new architecture of the worldwide Web that provides concept-based content to intelligent agents (Sausa, 2013, quoted in Zardari, 2016). It also enables access to automated information based on the meaning of machine-processable data (Karimi, 2010). On the Semantic Web, ontology is a critical technology that can describe concepts, relationships between entities, and categories of things (Lan et al.,2022). Today, on the Semantic Web, ontologies are used to improve the meaning of data. An appropriate framework of relationships between concepts emerges with less ambiguity by presenting an ontology. Photography can be considered a vast network of relationships between entities and images to represent knowledge in information systems (Sausa, 2013, quoted in Zardari, 2016). Ontology plays an essential part in the semantic web by systematically describing terms and relationships (Radhi,2022). The existence of ontologies with precise semantic relationships is necessary to improve and strengthen retrieval systems and automated processes of machine reasoning and the semantic web, but creating them is costly and time-consuming. Photography as a backbone can provide a semantic representation of appropriate knowledge, for the right people, at the right time and therefore help knowledge management systems achieve the goals that are the mission of these systems (Sharif, 2008). Photography is used as a conceptual knowledge base in various fields: information storage and retrieval, geographic information systems, digital libraries, etc. (Gomez-Perez 1999; Ding and Fu, 2000; Shams Fard and Abdollahzadeh Barforosh, 2002; Fathian, 2012, quoting Zarnegari, 2016). The first and most tangible result of the formation of the semantic web is the change in information retrieval (Mohammadi Estani, 2016). Ontology is a tool for

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representing knowledge in the field of organizing learning and artificial intelligence, and the emphasis on its application in the Semantic Web has been considered by scientists in the last decade (Hosseini Beheshti and Ejei, 2014). Semantic Web technologies are an approach to manage knowledge by using ontologies and semantic web standards, allow individuals to establish data repositories on the Web, create vocabularies, and write rules for data processing (Giannakoulopoulos et al., 2022).

Occurrence analysis is a content analysis method that works through the coexistence of words with concepts in texts and documents. The main ideas of a scientific field can be identified and by this knowledge and the conceptual patterns of the field the scientific structure can be drawn.

The conceptual network explores hierarchical relationships of abstract concepts and categories and manages the domain. In other words, the coherent analysis of words is a tool for discovering hidden patterns and emerging conceptual events (Ahmadi and Asareh, 2017). The drawing of scientific maps is not the only goal, but after drawing the desired maps, their analysis and interpretation must be done, which is a critical step. To interpret scientific maps, social network analysis techniques can be used; Because scientific maps have a structure similar to social networks. The analysis of social networks as a branch of sociology that studies networks suggest different indicators to determine the network's nodes or important and central actors (Shokfteh and Hariri, 2013). Just showing an attractive scientific map does not help advance the field, and it is the correct analysis of the map that puts the right path before researchers and paves the way for future scientific research. Therefore, this study intends to review the topics and cooperation of the research universities and analyze the results by reviewing the articles conducted in six databases of Magiran, Sid, Normagz, Civilica, Ganj, and the comprehensive portal of humanities. Mohammadi Estani, Azargoon, and Cheshmeh Sohrabi's (2016) research are of applied type. The research community includes books, articles, specialized glossaries, theses, dissertations, and research projects in scientometrics in Persian. To collect data, internal databases and search of related sources were used. The field analysis approach was used to create a conceptual model in the field of scientometrics and explain the relationships and examples. Experts in the field of scientometrics confirmed the face and content validity of the conceptual model of scientometrics. The tool used to build the onto is the version 5 software project. The method used is the OAsys Bermejo 2007 method with some modifications. The results showed that scientometric mapping ontology was formed in eleven main classes with 20 relationships and 100 samples. Orthography can be a useful and efficient tool to represent knowledge in this field. Also, this odontography can be a basis for developing future terms and concepts in this field. Biranvand and, Khaseh (201,6) aimed to investigate the effects of the semantic web using citation analysis using a spectroscopic method using the Web of Science database from 2000 to 2015. The results showed that in the twentieth century, the Semantic Web had witnessed six major leaps in 1962, 1965, 1975, 1979, 1983, and 1995, respectively. The field of the semantic web has also been influenced by works from various topics such as linguistics, knowledge representation, and artificial intelligence. Azimi and Dakhsh (2020) in a study to determine the emergence of prominent topics and draw the intellectual structure of semantic web research using the scientometric method and social network analysis indexed in the web of science database from 1990–2019. The results show that the main growth of the Semantic Web occurred in the 19th century. The most influential author is Michel Dumontier, and the University of Karlsruhe has published the largest number of works.

The topics of computer science and interdisciplinary applications, engineering, control automation systems, and artificial intelligence are the most important emerging topics in this field, respectively. Hosseini Beheshti et al. (2021), in a study entitled Bibliometric study and network analysis of co-authorship and thematic clusters of ontological research analyze bibliometrics and networks co-authorship and thematic clusters of ontological studies in the Scopus database, conducted research with the scientometric approach. The findings indicate that China, the United States, and the United Kingdom have contributed the most to the production of ontological research. Rafael Valencia Garcia and the University of Zhejiang have the most scientific production in the field of writers and universities. Theputer science has had the largest share in scientific production, and five thematic clusters have been identified, of which the semantic web cluster is the largest. Hosseini et al. (2021), in a study entitled Bibliometrics and Co-occurrence Mapping in the Field of Linked Data, delineate the analysis of the co-occurrence network of words and thematic clusters in the field of linked data in the period 1986–2018 with the Co-occurrence Analysis Method Vocabulary. They found that in terms of co-occurrence of it, "linked data" and "semantic web" had the highest frequency. Co-occurrence clustering led to 5 clusters, and hierarchical

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clustering led to 2 clusters. The United States and the various fields of "computer science" have the highest frequency in this field's subject category of the web of sciences. Most of the published studies were in the two contexts of "health" and "cultural heritage." The "core concepts in linked data" cluster are the most mature and central clusters. The "application of linked data in the context of the cultural heritage" cluster is developed but distinct. Bansal, Bansal, and Kumar (2020), in their research, examined 2892 Indian journals in the field of semantic web research indexed in the Scopus database for the years 2007 to 2016. The data show that India has an average annual growth rate of 26.37% and a qualitative citation effect averaging 3.83 citations per article. India's share of international articles was ICP (13.52), which fell from 15.08 to 12.89 approximately 2007–11 and 2012–16. The top 10 most productive countries separately accounted for a global share of 3.02% to 18.23%, followed by the United States with the largest share of global publications (18.23%), followed by China (14.66%). The top 10 countries also account for 75.82% of global publications. The top 10 most influential research institutes and authors contributed 24.97 and 7.09 for their share of global publications and 23.91 and 7.51 for their share of global citations during the study. Ding (2020), in a study examining the semantic web bibliometrics by collecting the Web of Science and Scopus data from 1960–2009, A total of 44,157 articles with 651,673 citations from Scopus and 22,951 articles with 571,911 citations from WOS is used to identify the most active authors and identify useful articles. This research also seeks to answer the following questions:

- What are the most common topics in the field of semantic web applications;
- what clusters have been formed in drawing a scientific map of the issues in this field based on the co-occurrence analysis;
- what groups have been formed in drawing a scientific map of cooperation between universities in this field based on the Co-occurrence analysis;
- What have been the subject networks and universities' collaboration networks, based on the criteria of social network centrality?

Liu et al. (2018), in a scientometric study using a web of science database from two methods of cluster analysis and citation analysis from 2001 to 2016, examined the ontology of GIS. The results show that the history of the study of the ontology of geographical information can be divided into approximately three periods. Also, computer science and mathematics play an important role in this field of study. In their research, Zhong et al. (2019) study scientometric analysis of construction ontology studies. They used the techniques of co-occurrence analysis of words, co-citation, and cluster analysis. From 2007 to 2017, they analyzed and illustrated networks. The results identified an extensive network of co-authors in this field to understand collaborative relationships. More than half of the articles (53%) were published in three countries: The United States, the United Kingdom, and Canada. The top keyword was "project management." Cluster analysis showed the formation of four topics: "domain ontology," "industry-based classes," "automated compliance review," and "building information modeling."

2. Literature Review

Extending the current web is a semantic web. The information is given a well-defined meaning and concept to enable subsidies and human beings to work better in interaction with each other. It is also called web-aware because its purpose is information whose meaning can be processed by a machine (Sharifi, Shabanzadeh and Fayyaz, 2012, quoted by Mohammadi Estani, 2017)

The Semantic Web is based on the principles of providing a semantic knowledge network, and it can present packets in the form of object-attribute-value propositions called triads. Generally, the Semantic Web consists of intelligent Web data that machine agents can understand and process. Thus, as Davis et al. Have highlighted, the Semantic Web labels information so that computer systems or users can process it more meaningfully (Davis, Litras, and Seth, 2007, quoted by Mohammadi Estani, 2016).

The semantic web, as a platform for representing knowledge, should explain the axis of cognition in its current structure and to the user, its context and cognitive conditions, the tools for acquiring cognition, how words are structured in context, and how are formed by man and used in its structure. The theory of conceptual spaces, due to having a geometric design, can place concepts and relationships between them in different contexts and make possible the formation of meanings in different contexts according to the user's cognitive contexts and create retrieval related to what is in the user's mind (Moradi, 2016)

Today, a growing trend of semantic web technologies is being formed in various fields such as knowledge management, data integration, and convergence with the semantic network (Alizadeh Noghabi, Kahani, and Shakibamanesh, 2016).

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3. Method

This study, which describes the topics and collaborations in the field of the semantic web application, is a descriptive-applied study with purposive sampling and has been done with a scientometric approach to social network analysis of the authors.

Purposeful sampling means creating a specific and transparent tool or goal for collection, the researcher's evaluation to select a sample on a community so that the sample represents the community. Meanwhile, the researcher's judgments are formed based on the information and purpose of the research (Delavar, 2010). Therefore, the statistical population of this study consists of all scientific work related to the use of the Semantic Web in various fields in the six databases of Magiran, Sid, Normagz, Civilica, Ganj, and the comprehensive portal of humanities. They have been selected as a sample for the research. Subjects of articles for analysis of topics and university authors of articles were extracted to study the cooperation between universities, and their map was drawn and analyzed.

3-1. Research Questions

1. What is the status of semantic web application topics?
2. How is a lexicon formed in the field of semantic web application?
3. What is the semantic map of topics in the field of web application?
4. What are the degree, betweenness, and closeness centers in semantic web application topics?
5. What is the collaboration map of the authors of the articles in the field of semantic web application?
6. What is the status of degree centers, betweenness, and closeness in institutions in the field of semantic web application?

3. Results

To analyze the data, first, the data extracted from the six databases of the articles were converted into the desired format of Ravar Matrix software, and their frequency was calculated. The frequency distribution of topics is reported in Table 1.

Table 1. Frequency of topics in the field of Semantic Web Applications

Topics	frequency	Row
Semantic Web	23	1
Ontology	17	2
Source Description Framework	4	3
Data Recovery	3	4
Extensible markup language	3	5

According to Table 1, the Semantic Web with a frequency of 23 in the first place and

Ontology and the source description framework are in second and third place with 17 and 4 repetitions, respectively. The following are Word Cloud topics in the field of semantic web applications.

Fig 1. the Word Cloud semantic web application

Word Cloud depicts the semantic web topics published in the six databases. Keyword semantic web, Ontology, Technology, Resource Description Framework, Digital Libraries, Storage and Retrieval, and Management showed on the map. The large and small word sizes are based on their frequency and frequency. Interestingly, due to the interdisciplinary nature of the semantic web subject, one can see a great variety of keywords in the subject area. In the following, for the issues of the articles, with the help of VoSviewer software, the co-occurrence of the topics is drawn, and the cases (of analysis are included) are analyzed.

Based on the communication and social network, the matrix of keywords was drawn through the Ravar Matrix software and converted into readable data in VoSviewer software. The map was drawn using it. The obtained data formed eight thematic clusters reported in Table 2.

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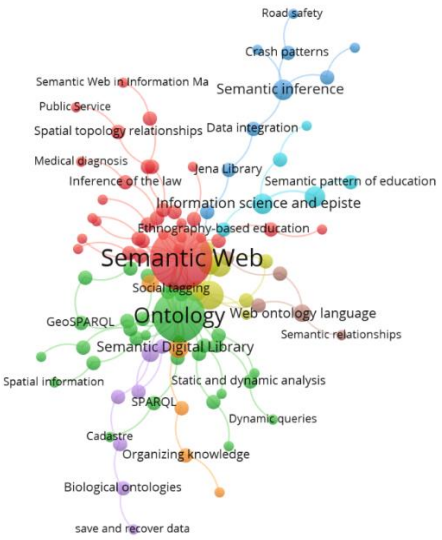

Fig 2. Co-occurrence Map of Semantic Web Application Topics

Table 2. Themes of clusters in the field of semantic web application

Clusters	keywords
1	Web 2/0 -Medical ontology- Semantic Web
2	Internet - ontology- virtual teaching
3	Semantic inference -Jena Library- JDL model
4	Extensible markup language -Source description framework- Web ontology
5	Information systems Biological ontologies - Artificial intelligence- Conceptual modeling
6	Information science and epistemology - Web3 technologies
7	Semantic Digital Library - Organizing knowledge - Digital Library
8	Web ontology language - Schematic of the source description framework

Based on Table 2, each cluster deals with different aspects of this field. In the first cluster, the Semantic Web and Web 2, in the second cluster, the Internet and virtual education, In the third cluster, semantic inference and models; in the fourth cluster, the topic of frameworks and web ontology; in the fifth cluster of artificial intelligence and biological ontology information systems; in the sixth cluster of Web 3 technologies and their epistemology, In the seventh cluster the semantic digital library and their organization And in the eighth cluster, the topics of Web ontology languages and their frameworks are discussed.

In the following, we will use centrality measures for better analysis. One of the proper metrics for analyzing social networks is Freeman's centrality metrics, including a degree of centrality, closeness, and betweenness. Centrality shows the types and number of relationships that a network member has with other members of that network (Kular et al., 2016). The metrics of the subject's centrality are reported in Table 3.

Table3. The metrics of the subject's centrality

Keyword	Degree	Keywords	Closeness	Keywords	Betweenness
Semantic Web	66	Spatial database	1	Ontology	8633.1
Ontology	44	The structure of jurisprudence	0.75	JDL model	5807.6
Source description framework	14	Ontology of jurisprudence	0.75	Digital Library	1584
Semantic inference	10	Worn tissue	0.66	Integration	1400
Information recovery	10	Spatial meanings	0.66	data	1212

According to Table 3, among degree centers, the semantic web 66 and the ontology 44 have the highest degree of centrality.
Also, among the betweenness centrality, semantic web with 8633, and ontology with 5807 have the highest betweenness centrality. Spatial databases with one and jurisprudence structure with 0.75 also have the highest degree of closeness. Then, the cooperation map of the Universities of authors was drawn.

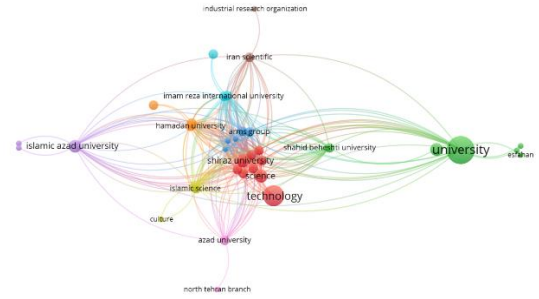

Fig 3. Collaboration map of Universities of article authors

According to the authors' collaboration map, the University of Tehran has the highest number of publications with 14 works; it also has the most connections with other universities in the country. The Ferdowsi University of Mashhad with six results and Isfahan with four pieces have the highest production. In Table 4, the centrality of universities in the field of semantic web applications is reported.

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Table 4. University centrality in the field of semantic web applications

Keywords	Degree	Keywords	Closeness	Keywords	Betweenness
University of Tehran	12	Islamic Azad University, Kerman	1	University of Tehran	58
University of Isfahan	3	Shahid Bahonar University	1	Tarbiat Modares University	36
Imam Reza International University of Mashhad	6	Imam Reza International University of Mashhad	1	Malek Ashtar University of Technology	28
Tarbiat Modares University	6	Payame Noor University of Mashhad	1	University of Isfahan	16
Malek Ashtar University of Technology	6	Hamadan University of Medical Sciences	1	Khajeh Nasir al-Din Tusi University of Technology	16

According to the data obtained in the table, the University of Tehran, the University of Isfahan, and the International University of Imam Reza of Mashhad, respectively, have the first to third ranks in the degree center. The Islamic Azad University of Kerman, Shahid Bahonar University of Kerman, and Imam Reza International University of Mashhad are ranked first to third in the centrality of closeness. The University of Tehran, Tarbiat Modares University, and the Malek Ashtar University of Technology have the highest degree and betweenness of centrality.

5. Discussion

Only 39 articles with the desired characteristics were found among the searched databases by targeted sampling. Initially, the topics and universities of each piece were extracted separately in their files and converted to the required format in Ravar Matrix software. Then, using this software, an abundance of keywords of subject and universities were obtained. Then their matrix was created using Vos viewer software; their maps were drawn, and their Relationship and the importance of each issue and university were analyzed separately. The frequency of thematic keywords was such as that of the Semantic Web with a frequency of 23 times and was in the first place. The ontology and source description framework with a frequency of 17 and 4 repetitions were in second and third place, respectively.

Comparing the results of this research with Azimi and Dakhesh's research, Newfound and superior topics are computer science and interdisciplinary applications Also, by comparing the research results with Beiranvand and Chase's research, more issues have been published around computer science. In Bansal et al.'s research also, ontology is in the first place. These differences in research results can be due to the progress and development of this field in different countries and its use and application in various areas.

The information obtained from the co-occurrence has shown that it formed eight subjective clusters. In the first cluster, Semantic Web and Web 2 are discussed; these topics show the progress of the Web toward the Semantic Web and more accurate searches. Also, the main topics related to health issues and information system management are topics of this cluster. Given the importance of the health system and related problems, it is reasonable for components such as the Semantic Web or the medical ontology to be among the priorities.

In the second cluster, the Internet and virtual or e-learning, the ontology has the highest weight, and interestingly, the children are the primary audience of this type of education. Also, databases and other components are the main topics of this cluster, which seems to be the application of the Internet and ontology and virtual training in this cluster. In the third cluster, the components of data integration and data mining or data analysis are r essential components for the main component, namely, semantic inference, which are the main concepts of this cluster. Semantic hypotheses and models have also been proposed to highlight the role of libraries and semantic retrieval.

In the fourth cluster, the components like information retrieval and source description framework and extensible markup language, and web ontology are at the top. Other features such as search engines and formatting and information services benefit the first components present and represent Themselves. The topic of frameworks and web ontologies and rules has emerged, and programming languages have been introduced. It shows the close relationship between these issues and Iran's progress on these issues. In the fifth cluster, the highest component is the conceptual models, which are closely related to artificial intelligence, information systems, and conceptualization. The other two members of this cluster include knowledge representation and the storage and retrieval of information affected by conceptual models because of proper implementation, effective knowledge delivery, and return. Artificial intelligence and information systems of biological ontology and advanced and practical applications in human life have been proposed.

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In the sixth cluster, the components of this cluster show the importance and role of Web 3 technologies and the epistemological viewpoint and the views of experts in determining educational patterns. In the seventh cluster, a component in this cluster is knowledge sharing. In other words, it is the result of other members in this field. Also, the representation of what is done in digital libraries, semantic digital libraries, social semantic digital libraries, and knowledge organization. It is displayed in the knowledge sharing and shows the changes over time. It causes progress in the digital library, and the semantic web moves in this direction and increases research. In the eighth cluster, the highest items are related to the web ontology language. Still, the lowest percentage is related to semantic relationships, and the essential things on the semantics Web are about relationships and communication.

One of the most basic principles in the field of the semantic web is the relationships between entities. Also, Web ontology languages, semantic web frameworks, and patterns are discussed. Despite the interdisciplinarity of this field and its application in medicine, artificial intelligence, etc., the obtained results show the further development of the Semantic Web in the areas of computer, artificial intelligence, and library. The results obtained in Biranvand and phase research also indicate this issue. Also, the results of Zhang et al. (2019) show the formation of four clusters of "domain ontology," "industry-based classes," "automated compliance study," and "building information modeling."

Among the centralities of degree and betweenness, semantic web, ontology has the highest rate. It indicates that these topics, in addition to the frequency among other issues in this field, play the role of link interface. The spatial database and the structure of jurisprudence also have the highest closeness of centrality. Meanwhile, according to the use and efficiency of different topics in different fields, issues can appear in different positions. Among the cooperation between universities, the University of Tehran has the most connection with other universities and research centers, and the University of Tehran, the University of Isfahan, and the International University of Imam Reza of Mashhad, respectively, placed in rank first to third in the degree of centrality. It indicates the frequency of research in these universities or research centers compared with other universities and research centers. The University of Karlsruhe in Germany is in the first place in Azimi, and Dakhesh's research, and the LECL Note Comput SCI is in the first place in the Ding's research. In the study of Bansal et al., Anna university Chennai is first.

In the study of Biranvand and Khase, the National University Of Ireland Nui Galway has taken first place. The Islamic Azad University of Kerman, Shahid Bahonar University of Kerman, and Imam Reza International University of Mashhad is ranked first to third in terms of closeness. This point shows the close relationship between these universities and other universities in the country. The University of Tehran, Tarbiat Modares University, and the Malek Ashtar University of Technology have the highest degree of centrality of betweenness. These universities are liaisons and are located among other universities. Finally, the results obtained from the analysis of articles published in this field led to the diversity and interdisciplinarity of this field. Additionally, researchers in the field of information science have entered the area of the semantic web. The matter is indicated by the keywords such as knowledge management, digital libraries, resource description framework, information retrieval, and metadata.

This field is developing in Iran, and researchers must work hard to reach other developed countries of the world. We hope to see progress in this field.

References

Ahmadi, H., & Osare, F. (2018). An overview of the functions of lexical analysis. *National Studies in Library and Information Organization*, 28 (1), 145-125.

Biranvand, A., & Khasseh, A. (2016). Discovery of evolution in the field of "Semantic Web" with the new approach RPYS. *Quarterly Knowledge and Information Management Journal*, 3(2), 37-48.

Azimi, M., & Dakhsh, S. (2021). Scientific study of semantic web research. *Caspian Journal of Scientometrics*, 8 (1), 43-30.

Bansal, M., Bansal, J., & Kumar, A. (2017). Semantic web research in India: A scientometric study of 2007-16. *International Journal of Information Dissemination and Technology*, 7(4), 253. doi.org/10.5958/2249-5576.2017.00034.6

Cordeiro, M.I., & Slavic, A. (2002). Data Models for Knowledge Organization Tools: Evolution and Perspectives.

Cuellar, M. J., Vidgen, R., Takeda, H., & Truex, D. (2016). Ideational influence, connectedness, and venue representation: Making an assessment of scholarly capital. *Journal of the Association for Information Systems*, 17(1), 1. https://doi.org/10.17705/1jais.00419

International Journal of Knowledge Processing Studies ‖ISSN: 2783-4611

de Castro Fernández, A. S. (2022). Semantic Web and Knowledge graphs: History and Evolution. 10.13140/RG.2.2.13299.66082(2)

Ding, Y. (2010). Semantic Web: Who is who in the field—a bibliometric analysis. *Journal of Information Science*, 36(3), 335-356.
DOI:10.1177/0165551510365295

Ghafori., N (2004). Using the Internet in Library Periodicals is a Step Towards Digital Libraries.

Giannakoulopoulos A, Pergantis M, Konstantinou N, Kouretsis A, Lamprogeorgos A, Varlamis I. Estimation on the Importance of Semantic Web Integration for Art and Culture Related Online Media Outlets. Future Internet. 2022;14(2):36. https://doi.org/10.3390/fi14020036

Hosseini Beheshti, M. S., & Ejei, F. (2022). Designing and implementing basic sciences ontology based on concepts and relationships of relevant thesauri. *Iranian Journal of Information Processing and Management*, *30*(3), 677-696.

Keshavarz, H. (2005). Transforming the Semantic Web Bringing the Web to Its Ultimate Capacity.

Kitchenham, B., Brereton, O.P., Budgen, D., Turner, M., Bailey, J. & Linkman, S. (2009), "Systematic literature reviews in software engineering – a systematic literature review", *Information and Software Technology*, 51 (1), 7-15. doi.org/10.1016/j.infsof.2008.09.009

Köhler, J., Philippi, S., Specht, M., & Rüegg, A. (2006). Ontology based text indexing and querying for the semantic web. *Knowledge-Based Systems*, *19*(8), 744-754. doi.org/10.1016/j.knosys.2006.04.015

Liu, Y., Li, L., Shen, H., Yang, H., & Luo, F. (2018). A co-citation and cluster analysis of scientometrics of geographic information ontology. *ISPRS International Journal of Geo-Information*, *7*(3), 120. https://doi.org/10.3390/ijgi7030120

Lan, G., Liu, T., Wang, X., Pan, X., & Huang, Z. (2022). A Semantic Web Technology Index. arXiv preprint arXiv:2201.07034. https://doi.org/10.48550/arXiv.2201.07034

Mohammadi, M., Azargon, M., & Cheshmeh Sohrabi, M. (2018). Methodology for constructing and designing ontologies: A case study in the field of scientometrics. *Information Processing and Management (Information Science and Technology)*, 33 (4), 1792-176.

Mohammadi, M. (2016). Semantic Web and its application in knowledge management. *Third Year Information and Knowledge Management Quarterly*, 3 (3), 21- 32.

Radhi, A. M. (2022). Adaptive Learning System of Ontology using Semantic Web to Mining Data from Distributed Heterogeneous Environment. *Iraqi Journal of Science*, 63(2), 740-758. doi.org/10.24996/ijs.2022.63.2.30

Sweet, M., & Moynihan, R. (2007). Improving population health: the uses of systematic review, New York: Millbank Memorial Fund.

Zardari, S. (2015). Information science and ontology engineering based on "Library and Information Encyclopedia". *PhD Thesis in Information Science and Knowledge. Chamran martyr of Ahwaz University*.

Zhong B, Wu H, Li H, Sepasgozar S, Luo H, He L. A scientometric analysis and critical review of construction related ontology research. Automation in Construction. 2019; 101: 17-31. https://doi.org/10.1016/j.autcon.2018.12.013